[0257] In one embodiment, the first resistance region is approximately 5 mils×120 mils (wherein 1 mil=0.001 inches) and the matching resistance region is approximately 10 mil× 80 mil. In an alternate embodiment, the height of the first resistance region may be approximately half that of the matching resistance region. FIG. **41** is a contour plot of the ratio of the matching region resistance to the read chamber resistance as a function of the matching region height and width (assuming a first resistance region height and width of mils×120 mils). The ratio is shown on a log scale, so 2=100 times higher, 0=matched, and −1=10 times lower. An approximate design area is defined in the graph by lines A and B and this design area may be used to select combinations of heights and widths (for a rectangular cross-section channel) that provide a suitable hydrodynamic resistance.

[0258] As shown in the figure, low hydrodynamic resistance connecting region **4030** may provide a Z-transition between regions in two different planes of a fluidic network. The volume of connecting region **4030** is selected to be greater than or to be roughly equal the volume of a "throw" region in inlet **4010** between two fluid sensing sites (**4012**) and (**4014**) shown as block arrows in the figure (which may, for example, be located so that fluid entering or leaving the region may be sensed by cartridge reader or other fluid control instrumentation). This configuration provides for back and forth mixing of the fluid slug in first resistance region **4020** at a well controlled fluid flow rate under air pressure or vacuum when the fluid slug volume is substantially equal (e.g., within 20%, 10% or 1%) to the combined volumes of first resistance region **4020** and the volume of the fluid slug is less than the combined volumes of first resistance region **4020** and connecting region **4030**. Preferably, the volume of the fluid slug is substantially equal (e.g., within 20%, 10% or 1%) of the combined volumes of the first resistance and connecting regions.

[0259] Accordingly, the invention includes a method of moving a fluid in a fluidic network comprising i) introducing a fluid slug into a fluid pathway comprising an inlet region (with a throw region), a first resistance region and a connecting region (where the fluid pathway and fluid slug are as described above), ii) moving the fluid slug under air pressure until the trailing edge passes sensing site **4014**, iii) moving the fluid slug under air pressure in the reverse direction until the leading edge (i.e., the trailing edge in step ii) passes sensing site **4012** and iv) repeating steps ii and iii a plurality of times to achieve a back-and-forth mixing action. Using this method, first resistance region **4020** remains filled throughout the mixing process, thus providing a roughly constant hydrodynamic resistance during this time. The method may further comprise clearing the fluid slug from the first resistance region through a matching resistance region as described above.

[0260] The fluidic network may also comprise valves to control the flow of fluid through the cartridge. A variety of suitable valves (including mechanical valves, valves based on electrokinetic flow, valves based on differential heating, etc.) will be known to one of average skill in the art of assay cartridges or microfluidic devices. In preferred embodiments, however, at least one and more preferably all actively controlled valve elements are external to the cartridge. In one embodiment, a fluid conduit has a flexible wall/diaphragm that in the absence of external force allows fluid to pass through the conduit. Application of an external force on the wall/diaphragm (e.g., from a piston or via the application of gas or hydrostatic pressure) causes the diaphragm to impinge on the conduit, thus impeding the flow of fluid.

[0261] The fluidic network may include at least one viscosity measuring conduit, preferably linked to a sample chamber or sample conduit, having an inlet and an outlet. The conduit is adapted so that a liquid sample can be introduced into the conduit and the time it takes the liquid to move between two locations in the conduit can be timed (preferably using sensors such as impedance sensors or optical sensors in the cartridge or an associated cartridge reader). Such an arrangement can advantageously be used to measure clotting times of a blood or plasma sample. For measuring clotting times, the conduit or an upstream component preferably comprises a dry reagent necessary for the specific clotting measurement (e.g., activated clotting time, whole blood clotting time, prothrombin time, thrombin time partial thromboplastin time and the like),

[0262] Vent ports as described above are, preferably, apertures on the surface of the cartridge that are in fluidic communication with fluidic chambers or conduits within the cartridge. In a laminated cartridge construction, the vent ports may be provided, for example, by apertures in cover layers that seal against a cartridge body to define planar fluidic networks or alternatively, by through-holes exposed on one surface of the cartridge body that communicate with fluidic networks on the opposing side. The vent ports act as control ports that allow a cartridge reader to control the movement of fluid in the cartridge, e.g., by a combination of sealing one or more ports, opening one or more ports to atmospheric pressure, connecting one or more ports to a source of positive pressure and/or connecting one or more ports to a source of negative pressure. The vent ports may also be used to introduce air into liquid streams passing through the fluidic conduits of the invention, for example, to segment the fluid streams with slugs of air. The introduction of air may be used to prevent mixing of two liquid slugs passed sequentially through a conduit, to clear a liquid from a conduit and/or to enhance the efficiency of a wash step. Preferably, the vent ports are arranged in a single row at a common location along the cartridge body's width. Such an arrangement and configuration of the control points advantageously allows the interface between the cartridge reader and the cartridge to be simplified. For example, using such a preferred configuration allows the cartridge reader to make use of a single fluidic mating device for placing the cartridge into fluidic communication with the cartridge reader. Such a configuration also allows the motion control subsystem(s) to be simplified in that a single motor or actuation device may be used to actuate the fluidic mating device and move it into sealing engagement with the cartridge body. FIG. **9** is a schematic representation of cartridge **900**, one preferred embodiment of a cartridge of the invention that incorporates many of the fluidic features described above. This exemplary embodiment depicts a cartridge comprising an electrode array of the invention as described above. The skilled artisan, however, can readily adapt the fluidic components and design to cartridges employing other detection chamber designs and/or detection technologies. The cartridge schematic shown in FIG. **9** comprises various compartments including a sample chamber **920**, assay reagent chamber **925**, waste chambers **930** and **931** and detection chambers **945** and **946** comprising electrode arrays **949***a* and **949***b* and electrode contacts **997** and **998**. Also depicted in FIG. **9** are fluid ports/vents **950-953** and **980** that may be utilized as fluidic control points, vents for allow-